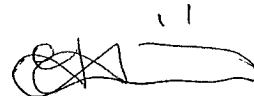


DECLARATION

I, the undersigned, Yoko OISHI, located at 2nd Floor, Kyohan Building, 2-7, Kandanishiki-cho, Chiyoda-ku, Tokyo 101-0054, JAPAN, do solemnly and sincerely declare that I fully understand the Japanese Language and the English Language and that the attached translation from the Japanese Language to the English Language of Japanese Patent Application No. 2002-290868 filed on October 3, 2002, (Reference Number: 542626JP01) is a true, correct and good-faith translation to the best of my knowledge and belief.

Dated this 19th day of April, 2011

A handwritten signature in black ink, consisting of a stylized 'Y' and 'O' followed by a horizontal line.

Yoko OISHI

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[Name of Item]	Specification	1
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[Name of the Document] SPECIFICATION  
[Title of the Invention] COMMUNICATION ADAPTER APPARATUS  
[Claims]

[Claim 1]

A communication adapter apparatus that connects one of plural connection object apparatuses having an apparatus object including information, which is based on functions of the apparatuses and operable control items, respectively, and a network to which a controller for remotely controlling the connection object apparatus is connected, characterized by including:

communication control means that controls transmission and reception of data to and from the network;

apparatus communication managing means that copies and saves the apparatus object, saves a procedure for a communication service of the communication control means, and makes it possible to use the connection object apparatus from the network using these saved data; and

apparatus interface means that is defined by standards common to all the apparatuses in order to make all the plural communication object apparatuses connectable.

[Claim 2]

The communication adapter apparatus according to claim 1, characterized by further comprising power supply managing means that manages a charged capacity inside an adapter, and in that the communication control means limits communication according to a management state of the power supply managing means.

[Claim 3]

The communication adapter apparatus according to claim 1, characterized by further comprising power supply managing means that manages a charged capacity inside an adapter, and in that the apparatus communication managing means limits accesses to the apparatus object according to a management state of the power supply managing means.

[Claim 4]

The communication adapter apparatus according to any one of claims 1 to 3, characterized in that the apparatus communication managing means includes: an apparatus interface access unit that is usable according to a procedure common to the connection object apparatuses; and an apparatus control access unit that is usable from the communication control means according to the common procedure and also includes at least one of permitting/prohibiting means that permits or prohibits an access to the apparatus interface access unit from the communication control unit and permitting/prohibiting means that permits or prohibits an access to the apparatus control access unit from the apparatus interface means.

[Claim 5]

The communication adapter apparatus according to any one of claims 1 to 3, characterized in that the apparatus communication managing means includes: an apparatus interface access unit that is usable according to a procedure common to the connection object apparatuses; and an apparatus control access unit that is usable from the communication control means according to the common procedure, and each of the apparatus interface access unit and the apparatus control access unit includes at least one of object managing means that performs management such as generation, deletion, and addition of instances and classes of the apparatus object, state acquisition procedure setting means that sets setting values held by the connection object apparatuses, a procedure for acquiring a state, a state change, a periodical notification, and the like, installation information managing means that sets and provides information on installation or arrangement of the connection object apparatuses, network attribute managing means that sets and provides attribute information concerning the network, and network band managing means that sets and provides information related to a communication band of the network.

[Claim 6]

The communication adapter apparatus according to any one of claims 1 to 3, characterized in that the apparatus communication managing means that, when the

connection object apparatuses are not connected yet, generates an imaginary apparatus object on the basis of a setting command, transmission of which is received via the network, and saves the imaginary apparatus object instead of the apparatus object.

[Claim 7]

The communication adapter apparatus according to any one of claims 1 to 3, characterized in that the apparatus communication managing means includes: an apparatus interface access unit that is usable according to a procedure common to the connection object apparatuses; and an apparatus control access unit that is usable from the communication control means according to the common procedure, and the apparatus communication managing means provides an imaginary apparatus in the apparatus control access unit on the basis of a setting command, transmission of which is received via the network, performs operation and setting for the imaginary apparatus and acquisition of a state involved in the operation and setting, and performs setting for running and stop of the apparatus object and acquisition of a state involved in the setting with the apparatus interface access unit.

[Claim 8]

The communication adapter apparatus according to any one of claims 1 to 3, characterized in that the apparatus communication managing means includes: an apparatus interface access unit that is usable according to a procedure common to the connection object apparatuses; an apparatus control access unit that is usable from the communication control means according to the common procedure; and a database that holds installation information for the apparatus object and the like, and each of the apparatus interface access unit and the apparatus control access unit includes writing/reading means that writes the installation information held by the database in and reads out the installation information to the connection object apparatuses.

[Claim 9]

The communication adapter apparatus according to any one of claims 1 to 3, characterized in that the apparatus communication managing means includes: an apparatus interface access unit that is usable according to a procedure common to the

connection object apparatuses; and an apparatus control access unit that is usable from the communication control means according to the common procedure, and each of the apparatus interface access unit and the apparatus control access unit includes: abnormality notifying means that detects in which of the apparatus interface; the communication control means; the network interface means; and the apparatus object abnormality has occurred and provides the network or the connection object apparatuses with information on the detected abnormality.

[Claim 10]

The communication adapter apparatus according to claim 9, characterized in that the communication adapter apparatus provides the network with the abnormality information when data transmission through the network is possible and provides the connection object apparatuses with the abnormality information when data transmission through the network is impossible.

[Claim 11]

The communication adapter apparatus according to claim 2, characterized in that the apparatus communication managing means includes: an apparatus interface access unit that is usable according to a procedure common to the connection object apparatuses; and an apparatus control access unit that is usable from the communication control means according to the common procedure, and the apparatus communication managing means limits communication to the communication control means according to a state of the power supply managing means using at least one of the apparatus interface access unit and the apparatus control access unit.

[Detailed Description of the Invention]

[0001]

[Field of the Invention]

The present invention relates to a communication adapter apparatus that connects electrical apparatuses, sensors, and other apparatuses to a network.

[0002]

[Prior Art]

A conventional communication adapter apparatus is constituted by only a communication unit that communicates control signals for remote control. Functions for interpretation of the control signals and management of system information are mounted on home appliance control units in home appliances (refer, for example, to Patent Reference 1 and Non-Patent Reference 1).

In addition, the conventional communication adapter apparatus incorporates a converting function for existing communication interfaces having different specifications for each apparatus to realize remote control (refer, for example, to Non-Patent Reference 2).

[0003]

[Patent Reference 1]

Japanese Published Unexamined Patent Application No. 2002-444745  
(paragraph 0050 on page 5 and Fig. 1).

[Non-Patent Reference 1]

ECHONET specification Ver 1.10 issued by ECHONET consortium (Section 7, page 3-1)

[Non-Patent Reference 2]

ECHONET specification Ver 1.10 issued by ECHONET consortium (Section 1, page 4-4, Fig. 4-1, form 4)

[Problem to be Solved by the Invention]

[0004]

As described above, since the conventional communication adapter apparatus does not have common interface mean to communication control means, there is a problem in that the communication control means cannot be changed according to a type of a network.

Since it is necessary to incorporate communication management and control programs for remote control in a control device in an apparatus, there is a problem in that burdens on resources such as microcomputers and cost of the resources increase.

Since the communication adapter is required to function together with an apparatus,



there is a problem in that various kinds of system setting cannot be performed unless all apparatuses come into an operating state at the time of execution of works.

Since an adapter itself holds communication installation information, when the adapter is replaced because of a failure or the like, there is a problem in that complicated work of resetting for the adapter involved in resetting for a system is required

When abnormality of the system occurs, since a control function is incorporated in the apparatus, there is a problem in that it is difficult to judge whether the adapter is abnormal or the apparatus is broken down.

[0005]

Furthermore, when it is attempted to have power supply from home appliances for simplification of execution of works, there no function .for power supply management and no means for providing and controlling information and there is no means for controlling functions of respective units. Thus, there is a problem in that it is essential to supply power to the respective units constituting the communication adapter and cost of power supply circuits of the home appliances increases.

[0006]

The invention has been devised in order to solve such problems and the first objective of the invention is to provide a communication adapter apparatus that gives common interface means to communication control means and is capable of changing the communication control means according to a type of a network.

The second objective of the invention is to provide a communication adapter apparatus for home appliances connectable to a network with little burden on resources such as microcomputers of the home appliances and little increase in cost of the resources.

[0007]

The third objective of the invention is to provide a communication adapter apparatus for which execution of works is simplified and it is possible to perform various kinds of system setting without connecting home appliances in an operating

state to the communication adapter apparatus.

The fourth objective of the invention is to provide a communication adapter apparatus that does not require complicated work such as system resetting at the time of replacement of the communication adapter and is replaceable easily.

The fifth objective of the invention is to provide a communication adapter apparatus that, when system abnormality occurs, makes it possible to judge whether an adapter is abnormal or a home appliance is broken down.

[0008]

Furthermore, the sixth objective of the invention is to provide a communication adapter apparatus for connecting home appliances through a network while saving power and without increasing cost of power supply to the home appliances to be connected.

[Means for Solving the Problem]

[0009]

A communication adapter apparatus according to the invention is a communication adapter that connects one of plural connection object apparatuses having an apparatus object including information, which is based on functions of the apparatuses, and operable control items, respectively, and a network to which a controller for remotely controlling the connection object apparatus is connected, the communication adapter including: communication control means that controls transmission and reception of data to and from the network; apparatus communication managing means that copies and saves the apparatus object, saves a procedure for a communication service of the communication control means, and makes it possible to use the connection object apparatus from the network using these saved data; and apparatus interface means that is defined by standards common to all the apparatuses in order to make all the plural communication object apparatuses connectable.

[0010]

[Embodiment of the Invention]

First embodiment

Fig. 1 is a block diagram showing an internal structure of a communication adapter apparatus according to a first embodiment of the invention.

In the figure, an apparatus 1 is a home appliance, a sensor apparatus, or the like and has an apparatus object 2 including information peculiar to the apparatus and operable control items.

A communication adapter apparatus 3 can use the apparatus object 2 in the apparatus 1 via apparatus interface means 4 that is commonly defined for the apparatus 1.

Apparatus communication managing means has functions for setting and operation of the apparatus object 2 held by the apparatus 1 and other management functions and is connected to communication control means 6 according to a predetermined procedure for use.

The communication control means 6 has a control function concerning communication for, via network interface means 7 and a network 8, transmitting and receiving data to and from another apparatus connected to the network.

[0011]

An operation of the communication control means 6 will be explained next.

A case in which an operation command is transmitted to the apparatus 1 connected to the network 8 by the communication adapter apparatus 3 from another apparatus connected to the network will be explained.

The network interface means 7 receives an operation command from the network 8 and passes the operation command to the communication control means 6. The communication control means 6 carries out various procedures for reception in association with the network interface 7. Then, the communication control means converts the acquired operation command into a predetermined format in order to pass the operation command to apparatus communication managing means 5, performs a predetermined procedure, and passes the operation command to the apparatus communication managing means 5. The apparatus communication managing means 5 analyzes the operation command and changes setting for control items of the apparatus

object 2 in the apparatus 1 using an apparatus interface 4 in order to set a control item of the apparatus object 2 corresponding to the operation command.

The apparatus 1 detects that the setting for the control item of the apparatus object 2 has been changed and, after carrying out operation corresponding to the control item, changes an information item changed by the operation. Here, a series of operation according to the operation command is completed.

[0012]

Next, an operation in notifying another apparatus connected to the network that the information item of the apparatus object 2 of the apparatus 1 has been changed will be explained.

The apparatus communication managing means 5 periodically monitors information items of the apparatus object 2 using the apparatus interface means 4. When a change in the information items is detected, the apparatus communication managing means 5 generates a command notifying the change in the information items, creates the command in a predetermined format, executes a predetermined processing in association with the communication control means 6, and passes the command to the communication control means 6.

The communication control means 6 performs a procedure for transmitting the command to the network 8 in association with the network interface means 7 to complete the transmission of the command to another apparatus connected to the network.

[0013]

As described above, the apparatus communication control means 5 has a management function for the apparatus object 2 mounted on the apparatus 1. Thus, processing functions realized by control means such as a microcomputer held by the apparatus 1 are reduced and the communication adapter apparatus 3 is added without imposing a burden on microcomputer resources, whereby it is possible to obtain an apparatus that is remotely operable from the network.

In addition, since the apparatus communication managing means 5 defines means

for connection with the communication control means 6 in a predetermined format and a predetermined procedure. Thus, for example, even when a change or the like occurs in a communication protocol, there is also an advantage that a communication adapter apparatus with high universality capable of changing a protocol easily is obtained by creating a communication control unit according to a defined interface.

[0014]

#### Second embodiment

Fig. 2 is a block diagram showing an internal structure of a communication adapter apparatus according to a second embodiment of the invention.

Components identical with or equivalent to those in Fig. 1 are denoted by the same reference numerals; thus, omit the explanation is omitted, and different components will be explained.

In the figure, power supply managing means 9 has a function of managing a state of a power supply in the communication adapter apparatus 3, for example, a usable residual amount of power. The power supply managing means 9 acts to apply predetermined limitations to the communication control means 6 and the network interface means 7 according to a state of the management.

[0015]

Next, an operation of the communication adapter apparatus will be explained.

Since an operation according to reception of an operation command and a notification system for a change in information are the same as those in the first embodiment, explanations of the operation and the notification system are omitted. An operation for power supply management will be mainly explained.

When the power supply managing means 9 has detected that, for example, a residual amount of power, which can be used in the communication adapter apparatus is only a little, the power managing means 9 instructs the network interface means 7 to shift to a mode for controlling power consumption of the network interface means 7 itself, for example, a standby mode. The power supply managing means 9 instructs the communication control means 6 to control communication frequency and notifies

the communication control means 6 that the network interface means 7 has changed to the standby mode. Moreover, the power managing means 9 also gives information such as a residual amount of power to the apparatus communication managing means 5 according to a predetermined procedure.

[0016]

When another apparatus connected to the network in this state transmits an operation command to the apparatus 1, the communication adapter apparatus 3 of which is connected to the network 8, the network interface means 7 detects the operation command on the network 8 according to a signal change or the like on the network 8. The network interface means 7 returns to a normal reception operation state from the standby mode to receive the operation command and pass the operation command to the communication control means 6. After performing various procedures concerning reception in association with the network interface 7, the communication control means 6 converts the acquired operation command into a predetermined format for passing the operation command to the apparatus communication managing means 5. Then, the communication control means 6 performs a predetermined procedure to pass the operation command to the apparatus communication managing means 5. After passing the command to the apparatus communication managing means 5, the network interface means 7 shifts to the standby mode. The apparatus communication managing means 5 analyzes the operation command and changes setting for the control items of the apparatus object 2 in the apparatus 1 using the apparatus interface means 4 in order to set a control item of the apparatus object 2 corresponding to the operation command.

The apparatus 1 detects that the setting for the control item of the apparatus object 2 has been changed and, after carrying out operation corresponding to the control item, changes an information item changed by the operation. Here, a series of operation according to the operation command is completed.

[0017]

Next, an operation in notifying another apparatus connected to the network that the

information item of the apparatus object 2 of the apparatus 1 has been changed will be explained.

The apparatus communication managing means 5 periodically monitors information items of the apparatus object 2 using the apparatus interface means 4. The apparatus communication managing means 5 limits accesses to the apparatus object 2 by, for example, extending a time interval for monitoring the information item according to power supply information obtained from the power supply managing means 9 and controls frequency of occurrence of events in the communication adapter apparatus 3. When the apparatus communication managing means detects a change in the information items, the apparatus communication managing means generates a command notifying the change in the information items, creates the command in a predetermined format, executes a predetermined processing in association with the communication control means 6, and passes the command to the communication control means 6.

After returning the network interface means 7 to the usual operation mode, the communication control means 6 performs a procedure for transmitting the command to the network 8 in association with the network interface means 7 to complete the transmission of the command to another apparatus connected to the network. After the completion of transmission, the network interface means 7 shifts to the standby mode again.

Note that, when the communication control means 6 passes a command to the network interface means 7 and causes the network interface means 7 to transmit the command, the communication control means 6 may take measures for further limitation of power consumption by, for example, delaying communication speed according to a content of detection by the power supply managing means 9.

[0018]

As described above, the communication adapter apparatus 3 includes the power supply managing means 9 and reduces power consumption in the communication adapter apparatus 3 according to a management state. Thus, for example, when there

is limitation on a power supply, for example, in the case of an apparatus that is required to be battery driven such as a sensor apparatus or when power is supplied from the apparatus 1, it is possible to secure operation within the limitation. Consequently, it is possible to obtain a communication adapter apparatus with which advantages such as control of an increase in cost of power supply to an apparatus and extension of a battery life are realized

[0019]

### Third embodiment

Fig. 3 is a block diagram of the communication adapter apparatus 3, which has a detailed internal structure of the apparatus communication managing means 5, according to a third embodiment of the invention.

Components identical with or equivalent to those in Figs. 1 and 2 are denoted by the same reference numerals; thus, the explanation is omitted, and different components will be explained.

In the figure, an apparatus control access unit 10 is constituted to interface with the communication control means 6 provided in the apparatus communication managing means 5 according to a predetermined format and a predetermined procedure. In addition, permitting means 14 and prohibiting means 15 are provided such that the apparatus control access unit can be permitted or prohibited from the apparatus interface means 4.

An apparatus interface access unit 11 is constituted to interface with the apparatus interface means 4 provided in the apparatus communication managing means 5 according to a predetermined format and a predetermined procedure.

In addition, permitting means 12 and prohibiting means 13 are provided such that the apparatus interface access unit 11 is permitted or prohibited from the communication control means 6.

[0020]

Next, an operation of the communication adapter apparatus 3 will be explained.

When the apparatus 1 cannot receive operation from a network in a state in which



the apparatus 1 is being initialized or when it is dangerous if the apparatus 1 is operated remotely from the network during maintenance or the like, the apparatus object 2 operates the prohibiting means 15 to be effective for the apparatus control access unit 10 via the apparatus interface 4 and prohibits an access to the apparatus control access unit 10 from the communication control means 6. By prohibiting the access, it is possible to control careless operation of the apparatus object 2 from the network 8. When the initialization, the maintenance, or the like ends to permit operation of the apparatus object 2, the apparatus object 2 operates the-permitting means 14 to be effective for the apparatus control access unit 10 via the apparatus interface means 4 and permits an access to the apparatus control access unit 10 from the communication control means 6. Note that the permitting means 14 and the prohibiting means 15 are controlled exclusively. When one is effective, the other is made ineffective.

[0021]

Next, a case in which an access from the apparatus object 2 to the apparatus communication managing means 5 is limited will be explained. When communication setting for the communication adapter apparatus 3 has not been completed, careless issuance of a command to the network and operation of the apparatus object 2 according to reception of a command should be prohibited in order to prevent malfunction of a system and danger for the system.

In such a case, the communication control means 6 operates the prohibiting means 13 to be effective for the apparatus interface access unit 11 and prohibits an access to the apparatus interface access unit 11. By prohibiting the access, since a command received by the communicating means 6 by mistake during the setting does not reach the apparatus interface means 4, it is impossible to operate the apparatus object 2. In addition, since the apparatus object 2 cannot access the apparatus communication managing means, transmission and reception of data to and from the communication control means 6 is interrupted. Note that permission of the access can be realized by operating the permitting means 12 to be effective.

[0022]

In the above explanation, the communication adapter apparatus 3 is used for control of illegal accesses. However, it is also possible to use the communication adapter apparatus 3 for applications for, for example, prohibiting an access to the apparatus control access unit 10 to prohibit multiple accesses from the communicating means 6 when the apparatus communication managing means 5 is initialized or changed from the apparatus object 2 via the apparatus interface means 4 or, conversely, prohibiting an access to the apparatus interface access unit 11 when the apparatus communication managing means 5 is initialized or changed from the communication control means 6 to initialize or change the apparatus communication managing means 5 safely.

[0023]

As described above, the apparatus control access unit 10 and the apparatus interface access unit 11 are provided in the apparatus communication managing means 5 of the communication adapter apparatus 3 and it is made possible to set permission and prohibition of accesses to the apparatus control access unit 10 and the apparatus interface access unit 11, respectively. Thus, at the time of initialization and maintenance for the apparatus 1 and the communication adapter apparatus 3, it is possible to obtain the communication adapter apparatus 3 in which work for the setting and the maintenance can be performed safely and surely.

[0024]

#### Fourth embodiment

Fig. 4 is a block diagram showing functions of the apparatus communication managing means according to the first or the second embodiment of the invention in detail. Components identical with or equivalent to those in Figs. 1 to 3 are denoted by the same reference numerals; thus, the explanation is omitted, and different components will be explained. In the figure, specific items inside the apparatus control access unit 10 and the apparatus interface access unit 11 are shown.

The apparatus control access unit 10 includes an object managing unit that performs management such as generation, deletion, and addition of instances and classes of the apparatus object 2 that are defined on the basis of definitions set between the apparatus

control access unit 10 and the communication control means 6, state acquisition procedure setting means for setting a method of acquiring a state of the apparatus object 2 of the apparatus 1, installation information managing means for managing, for example, information on locations where the apparatus 1 and the communication adapter apparatus 3 are set, network attribute managing means that manages attributes of a network such as a type of the network, and network band managing means that manages a communication band (a communication capacity) and the like of the network.

The apparatus interface access unit 11 also includes means with the identical function that is defined on the basis of the apparatus interface 4 as in the apparatus control access unit 10.

[0025]

Fig. 9 shows an example of a structure of a system in which a communication node 20 or 21 including the communication apparatus 3 and the apparatus 1 according to the invention, a network sensor 22 or 23 including a sensor apparatus and the communication adapter apparatus 3, and a controller 30 are connected with the network 8 as a network.

The operations of the various means explained above in the initial setting will be hereinafter explained on the basis of this system diagram.

When the communication adapter apparatus 3 is connected with the apparatus 1, the communication adapter apparatus 3 is required to disclose, for example, various kinds of information as a communication node for the controller 30.

[0026]

To acquire information of the apparatus object 2 in the apparatus 1, the apparatus communication managing means 5 uses the object managing means of the apparatus interface access unit 11 to sequentially acquire the information of the apparatus object 2 via the apparatus interface means 4. When the initialization is completed and the apparatus 1 is started, an instance change (start) in the apparatus object 2 is detected. Thus, in order to notify the network 8 of the instance change, the apparatus

communication managing means 5 uses the object managing means of the apparatus control access unit 10 to transmit an instance charge notification command to the communication control means 6. The communication control means 6 having received the command transmits the command to the network 8 in association with the network interface means 7. The controller 30 receives this command and detects that the apparatus 1 is started. Next, the controller 30 sets acquiring means for various states of the apparatus object 2. A method of acquiring the states can be realized by various methods such as receiving notification when an event has occurred in the apparatus 1, periodically notifying a state that the communication adapter apparatus 3 acquires by accessing the apparatus 1, or issuing a monitor command when the controller 30 needs the command and acquiring a state from a response from the controller 30.

[0027]

Then, the controller 30 determines an acquisition method from the methods explained above, generates a setting command, and transmits the setting command to the network. The network interface means 7 of the communication adapter apparatus 3 receives the command and passes the command to the communication control means 6. The communication control means 6 uses the state acquisition procedure setting means provided in the apparatus control access unit 10 in the apparatus communication managing means 5 according to a predetermined procedure and sets the acquisition method instructed by the controller 30 in the apparatus communication managing means 5. The apparatus communication managing means 5 uses the state acquisition procedure setting means of the apparatus interface access unit 11 to communicate the same setting contents to the apparatus object 2 via the apparatus interface means 4. Here, the apparatus communication managing means 5 communicates the setting contents to the apparatus object 2 such that inconsistency is not caused between the apparatus object 2 and the communication adapter apparatus 3.

[0028]

Next, setting for installation information of the apparatus 1 is performed. Various

methods are possible for the setting of the installation information. Here, a method of giving the installation information from the controller 30 will be explained.

When an installation position of the apparatus 1 is inputted from a user or the like, the controller 30 generates a setting command for the position and transmits the setting command to the network. The network interface means 7 of the communication adapter apparatus 3 receives the command and passes the command to the communication control means 6. The communication control means 6 uses the installation information managing means provided, in the apparatus control access unit 10 in the apparatus communication managing means 5 according to a predetermined procedure and sets the installation information instructed by the controller 30 in the apparatus communication managing means 5. In addition, the apparatus communication managing means 5 is also capable of using the installation position managing means of the apparatus interface access unit 11 to communicate the same setting contents to the apparatus object 2 via the apparatus interface means 4 as required.

When the installation position information is inputted from the apparatus 1, it is possible to provide the controller 30 with the installation information of the apparatus through a route opposite to the route described above.

[0029]

Next, a method of notifying the controller 30 and the apparatus 1 of network attributes held by the communication adapter apparatus 3 will be explained.

The controller 30 and the communication adapter 3 are required to share items related to the network interface means 7 such as network attributes (a type and a physical address of a network) in order to identify an individual and correct a difference of a response time or the like due to a medium in respective control programs. The apparatus communication managing means 5 can acquire this information from the communication control means 6 and the network interface means 7 using the network attribute managing means of the apparatus control access unit 10. To notify the controller 30 of this information, the apparatus communication managing means 5 uses

the network attribute managing means of the apparatus control access unit to pass attribute information to the communication control means 6. The communication control means 6 issues a command corresponding to the attribute information to the network interface means 7 and transmits the command to the network 8. The controller 30 receives this command and acquires information on a network attribute. In addition, on the basis of this information, the apparatus communication managing means 5 sets an interval or the like for accessing the apparatus object 2 through the apparatus interface means 4.

[0030]

Next, a method of setting a network band will be explained.

Concerning the network band, there are various objects and methods of setting such as setting of a band that is required in a system, notification of a setting value defined from limitation of the communication adapter apparatus 3, and setting of a band required by the apparatus 1.

In order to cope with the various methods and objects, the network band managing means provides the network band managing unit provided in the apparatus control access unit 10 as a route from the communication control means 6 side, that is, the controller 30 or the like through the network. In addition, the network band managing means also provides a network band managing unit in the apparatus interface access unit 11 such that setting can be performed in response to a request from the apparatus 1 side. By providing these means, it is possible to cope with the setting through the network, the limitation in the communication control means 6 and the network interface means 7, and the setting from the apparatus 1. A method of setting from these units to the apparatus communication managing means 5 can be performed in the same manner as the method for the attribute or the like. In addition, a method of access for using these setting values in the respective units is the same as the method for the network attribute, an explanation of the method is omitted.

[0031]

As described above, since the object managing means, the state acquisition

procedure setting means, the installation information managing means, the network attribute managing means, and the network band managing means are provided and constituted to be accessible freely, it is possible to share information with a controller in system setting and the like. In addition, since the apparatus communication managing means 5 in the communication adapter apparatus 3 manages the information, it is possible to obtain the communication adapter apparatus 3 that allows an apparatus to be used as a node applicable to a network without imposing a burden on the apparatus 1.

[0032]

#### Fifth embodiment

Fig. 5 is a block diagram showing the function of the apparatus communication managing means according to the first or the second embodiments of the invention in detail. Fig. 5 mainly explains a function that is used at the time of installation adjustment or the like.

The apparatus control access unit 10 and the apparatus interface access unit 11 include means for setting start and stop of operation of the apparatus object 2 managed by the apparatus communication managing means 5 and acquiring states of operation and stop of the apparatus object 2, means for setting operation and stop and acquiring states of operation and stop of the communication control unit 6 from the apparatus interface access unit 11, and means for imaginarily setting operation for the apparatus object 2 managed by the apparatus communication managing means 5 and means for imaginarily setting an apparatus.

[0033]

Next, an operation of the apparatus communication managing means 5 will be explained.

The operation will be explained on the basis of a procedure for setting and test run of a system only with the communication adapter apparatus when the apparatus 1 is in an unconnected state.

The controller 30 shown in Fig. 9 transmits a setting command for a connected apparatus to the communication adapter apparatus 3. This command is transmitted

through the network interface means 7, interpreted by the communication control means 6, and gives information to connected apparatus setting means of the apparatus control access unit 10. An imaginary apparatus is generated in the apparatus communication managing means 5 on the basis of this information. Thereafter, the controller 30 is capable of performing trial run and setting for the system using means provided in the apparatus control access unit 10 for imaginarily operating and setting the imaginary apparatus generated in the communication adapter apparatus 3.

[0034]

When verification or the like of the system is carried out, an operation for removing a specific apparatus object from the system-intentionally and reconnecting the apparatus object may be necessary. For such an application, the apparatus communication managing means 5 includes means that can set start and stop of operation of the apparatus object 2 managed by the apparatus communication managing means 5 and acquisition of states of the start and stop of operation of the apparatus object 2. In stopping the apparatus object 2, the communication adapter apparatus 3 accesses stopping means provided in the apparatus control access unit of the apparatus communication managing means 5 according to a predetermined procedure and instructs the apparatus communication managing means to stop the apparatus object 2. The apparatus communication managing means 5 stops the apparatus object 2 via the apparatus interface 4 using the stopping means of the apparatus interface access unit 11. Conversely, to start operation of the apparatus object 2, it is possible to bring the apparatus object 2 into an operation state according to the same method using starting means instead of the stopping means.

[0035]

As described above, the communication adapter apparatus 3 is constituted to be capable of controlling start and stop of the apparatus object 2 freely and performing verification of an action by the imaginary apparatus by itself. Thus, it is possible to obtain a communication adapter apparatus that can easily carry out system setting in the case in which an apparatus is not in an operation state at the time of execution of works



and can efficiently perform verification work at the time of system development.

[0036]

#### Sixth embodiment

Fig. 6 is a block diagram showing a function of the apparatus communication managing means 5 according to the first or the second embodiment of the invention in detail. Fig. 6 mainly shows a function for promoting convenience in replacement or the like of the communication adapter apparatus 3.

Memory writing control means and memory reading control means are set in the apparatus control access unit 10 and the apparatus interface access unit 11 in the apparatus communication managing means 5 as means for accessing a nonvolatile memory provided in the apparatus object 2 in the apparatus 1.

[0037]

An operation of the apparatus communication managing means 5 will be hereinafter explained.

The communication adapter apparatus 3 holds information such as addresses required in network communication and the various setting values described in the third embodiment. The communication adapter apparatus 3 constitutes a communication node together with the apparatus 1.

When the communication adapter apparatus breaks down because of some cause, replacement work for the communication adapter apparatus 3 is required. The communication adapter apparatus 3 of the invention stores the setting contents described above in a memory of the apparatus object 2 according to the following procedure.

The apparatus communication managing means 5 holds all pieces of setting information. When setting is completed, the apparatus communication managing means 5 causes the memory writing control means of the apparatus interface access unit 11 to store the setting information in the memory in the apparatus object 2 through the apparatus interface 4.

[0038]

Next, when the communication adapter apparatus 3 is replaced, the apparatus communication managing means 5 uses the memory reading control means of the apparatus interface access unit 11 to access the memory in the apparatus object 2 and acquire the setting information. The apparatus communication managing means 5 holds the acquired setting contents in the database 5 and provides necessary information to the communication control means 6 and the network interface means 7. As a method of providing of the information, the apparatus communication managing means 5 uses the memory reading control means in the apparatus control access unit 10 to notify the network interface means 7 through the communication control means 6. In this way, it is possible to restore the setting values only in the communication adapter apparatus 3.

[0039]

In order to store information that is not managed by the apparatus communication managing means 5 such as information in the communication control means in the apparatus object 2, the information is written in the apparatus object 2 through the apparatus communication managing means 5 using the memory writing control means in the apparatus control access unit 10.

[0040]

As described above, since it is possible to temporarily store the information in the communication adapter apparatus 3 in the apparatus object in the apparatus 1, it is unnecessary to perform resetting and the like of a system that are required conventionally in replacement of the communication adapter apparatus 3 and it is possible to obtain the communication adapter apparatus 3 that can be replaced easily.

[0041]

Seventh embodiment

Fig. 7 is a block diagram showing a function of the apparatus communication managing means 5 according to the first or the second embodiment of the invention in detail. The apparatus communication managing means 5 mainly includes means that provides the apparatus communication managing means 5 with contents of abnormality

such that it is possible to easily specify an abnormal section in various abnormal states detected by the communication adapter apparatus 3.

The apparatus communication managing means 5 includes network interface abnormality means that provides abnormality concerning the network 8, communication control abnormality means for providing abnormality of the communication control means 6, apparatus interface abnormality means for providing abnormality concerning the apparatus interface means 4, and apparatus abnormality means for providing abnormality of an apparatus.

[0042]

Next, an operation of the apparatus communication managing means 5 will be explained.

The apparatus communication managing means 5 collects information on abnormality detected in the respective components comprising the network interface means 7, the communication control means 6, the apparatus interface 4, and the apparatus 1 (the apparatus object 2) through the apparatus control access unit 10 and the apparatus interface access unit 11, and manages the information unitarily while sequentially updating the information. For example, when the controller 30 checks abnormality, which occurs in the apparatus 1 of the communication node 20 shown in Fig. 9, through the network, the controller 30 issues a command for accessing the apparatus abnormality means in the apparatus communication managing means 5. As a result, an acquisition command for apparatus abnormality is executed via the network interface means 7 and the communication control means 6, and data of apparatus abnormality managed by the apparatus communication managing means 5 is provided to the controller 30 through the communication control means 6, the network interface means 7, and the network 8. It is also possible to acquire information on abnormality of the apparatus interface means 4 in the same procedure by changing an access destination to the apparatus interface abnormality means.

[0043]

Concerning abnormality related to the network 8, since it may be impossible to

provide information through the network, in this explanation, it is assumed that a display function is provided in the apparatus object 2. The apparatus object 2 uses the apparatus interface means 4 to access the network abnormality means or the communication control abnormality means of the apparatus interface access unit 11 and acquire information on abnormality of the communication control means 6 or the network interface means 7 from the apparatus communication managing means 5. When some abnormality is detected, the apparatus object 2 carries out display or the like corresponding to contents of the abnormality.

[0044]

As described above, since the apparatus communication managing means 5 has the means for classifying abnormality states, which are detectable inside the communication adapter apparatus 3, and notifying the network 8 or the apparatus 1 of the abnormality states. Thus, when deficiency of the system occurs, it is possible to easily judge whether the deficiency is caused by a failure of the apparatus or a failure of the communication adapter apparatus 3 and judge whether abnormality of the communication adapter apparatus 3 is caused by a failure of the apparatus interface means 4 or abnormality of the communication control means 6. Thus, it is possible to obtain a communication adapter apparatus that is capable of specifying a point of deficiency efficiently and restoring the system promptly.

[0045]

#### Eighth embodiment

Fig. 8 is a block diagram of the communication adapter apparatus 3 that operates with power fed from the apparatus 1 through the apparatus interface means 4 according to the second embodiment of the invention.

Components identical with or equivalent to those in Figs. 1 to 7 are denoted by the same reference numerals; thus, the explanation is omitted.

[0046]

The apparatus control access unit 10 and the apparatus interface access unit 11 include, other than means for using the apparatus object 2, state providing means that

provides various states of the power supply managing means 9, power supply control means for controlling the power supply managing means 9, and power supply ability acquiring means for acquiring power supply ability or the like. In addition, the apparatus control access unit 10 and the apparatus interface access unit 11 include communication limitation control means for controlling limitation on the communication control means according to information of these means.

The network interface means 7 has a function of interface to the network 8, a function capable of limiting power consumption of the network interface means 7 itself such as functions of shifting or returning to the standby mode, changing transmission speed, and the like. (In general, it is known that network interface means consumes large power at the time of a transmission operation.)

The power supply managing means 9 includes a charge/discharge control unit and a control unit, and has a function of receiving supply of power from the apparatus interface means 4 and charging this power, a function of supplying power to the respective units as required, and a function of providing suppliable power capacity based on the present charged capacity.

[0047]

Next, an operation of the communication adapter apparatus 3 will be explained.

At the time of build-up, the communication adapter apparatus 3 accesses the apparatus object 2 of the apparatus 1 using the power supply ability acquiring means of the apparatus interface access unit 11 through the apparatus interface means 4 and acquires a capacity of power suppliable from the apparatus 1 into the apparatus communication managing means 5. In addition, the communication adapter apparatus 3 acquires and holds power supply capacity data necessary for operations of the communication control means 6 and the network interface means 7 using the power supply capacity acquiring means of the apparatus control access unit 10.

The power supply managing means 6 accesses the power supply capacity acquiring means in the apparatus control access means 10 to acquire information on the acquired power supply capacity to be supplied and a power supply capacity necessary for

operations, and sets duty of charge and discharge and a system for power saving control of the communication control means.

[0048]

For example, when electric power necessary for an operation is 3 in a period in which suppliable electric power is 1, the power supply managing means 9 controls an operation of the communication adapter apparatus 3 within electric power to be supplied by carrying out control for, for example, allowing operations of the communication control means 6 and the network interface means 7 using the apparatus control access means for the period in which the electric power is 1 after charging the electric power of 3.

When such an intermittent operation is not allowed depending on an application, the communication control means 6 acquires a state of the charge/discharge control unit managed by the power supply managing means 9 from the apparatus communication managing means 5 via the apparatus control access unit 10. Every time an event of a transmission request for data is issued, the communication control means 6 monitors information of the power supply managing means to judge whether the charge/discharge control unit has reached a charged state in which a transmission operation is possible and controls a mode of the network interface means 7. If the charge/discharge control unit is not in the state in which transmission is possible, the apparatus communication managing means 5 is capable of providing a source of issuance of the transmission event with information, which indicates that the communication adapter apparatus 3 is on standby for transmission, through the communication limiting means. In addition, concerning a reception operation, the apparatus communication managing means 5 operates to start the reception operation by, for example, controlling the network interface means 7 to the standby mode and controlling the network interface means 7 to the normal mode according to a signal change or the like of the network 8. However, in the case of reception, it is also possible to shift the network interface means 7 to the normal mode via the communication limiting means when a charge state of the charge/discharge control unit

in the power supply managing means 9 is insufficient for a reception operation.

[0049]

The apparatus communication managing means 5 provides the apparatus object 2 with a power supply state of the power supply managing means using the state providing means provided in the apparatus interface access unit 11. Consequently, if the apparatus object 2 has a function of generating a transmission event spontaneously, the apparatus communication managing means 5 is also capable of limiting the function and controlling transmission power.

When the apparatus communication managing means 5 manages an access to the apparatus object 2, according to a grasped power supply state, the apparatus communication managing means 5 uses the communication limiting means of the apparatus interface access unit 11 to adjust frequency and a time interval of access to the apparatus object 2 via the apparatus interface 4. Consequently, it is possible to adjust frequency of occurrence of a transmission event according to an electric power capacity.

[0050]

As described above, when only limited power is supplied from the apparatus 1, it is possible to operate the communication adapter apparatus 3 in a range of suppliable electric power using the power supply managing means 9 provided in the communication adapter apparatus 3 and the means for providing various kinds of information and the communication limitation control means provided in the apparatus communication managing means 5. Thus, when a communication adapter apparatus is added in order to connect a home appliance through the network, it is possible to obtain a communication adapter apparatus for which power supply work is unnecessary and it is possible to perform execution of works easily.

[0051]

[Effects of the Invention]

As described above, according to the first embodiment, the apparatus communication managing means has a function of managing an apparatus object 2

mounted on an apparatus 1. Thus, a processing function realized by control means such as a microcomputer provided in the apparatus 1 is reduced and it is possible to obtain an apparatus, which can be remotely operated from a network, by adding a communication adapter apparatus 3 without imposing a burden on microcomputer resources.

In addition, the apparatus communication managing means 5 defines the means for connection with the communication control means 6 according to a predetermined format and a predetermined procedure. Thus, there is also an advantage that, for example, even when a change of a communication protocol or the like occurs, a communication adapter apparatus 3 with high universality, with which protocol change is easily possible, is obtained by creating the communication control unit according to a defined interface.

Moreover, according to the second embodiment, the communication adapter apparatus 3 includes the power supply managing means 9 and reduces power consumption in the inside thereof corresponding to a management state. Thus, for example, in the case of an apparatus 1 that is required to be battery driven such as a sensor apparatus or when power is supplied from an apparatus 1, when there is limitation on a power supply, it is possible to secure operation within the limitation. Consequently, it is possible to obtain a communication adapter apparatus 3 with which advantages such as control of an increase in cost of power supply to an apparatus 1 and extension of a battery life are realized.

#### [Brief Description of the Drawings]

##### [FIG. 1]

A block diagram showing a communication adapter apparatus according to a first embodiment of the invention.

##### [FIG. 2]

A block diagram showing a communication adapter apparatus according to a second embodiment of the invention.

##### [FIG. 3]



A block diagram of apparatus communication managing means of a communication adapter apparatus according to the first or the second embodiment of the invention in detail.

[FIG. 4]

A block diagram showing apparatus communication managing means of a communication adapter apparatus with respect to a function relevant to initiation in particular, in detail, according to the first or the second embodiment of the invention.

[FIG. 5]

A block diagram showing apparatus communication managing means of a communication adapter apparatus with respect to a function used in a system verification in particular, in detail, according to the first or the second embodiments of the invention.

[FIG. 6]

A block diagram showing apparatus communication managing means of a communication adapter apparatus with respect to a memory access function in particular, in detail, according to the first or the second embodiment of the invention.

[FIG. 7]

A block diagram showing apparatus communication managing means of a communication adapter apparatus with respect to a function for providing abnormal states in particular, in detail, according to the first or the second embodiment of the invention.

[FIG. 8]

A block diagram of the communication adapter apparatus with respect to a power control, in detail, according to the second embodiment of the invention.

[FIG. 9]

A figure showing the configuration of the system including a controller according to the first or the second embodiment of the invention.

[Explanation of Reference Numerals]

1: Apparatus

- 2: Apparatus object
- 3: Communication adapter apparatus
- 4: Apparatus interface means
- 5: Apparatus communication managing means
- 6: Apparatus control means
- 7: Network interface means
- 8: Network
- 9: Power supply managing means

[Name of Document]        Abstract

[Abstract]

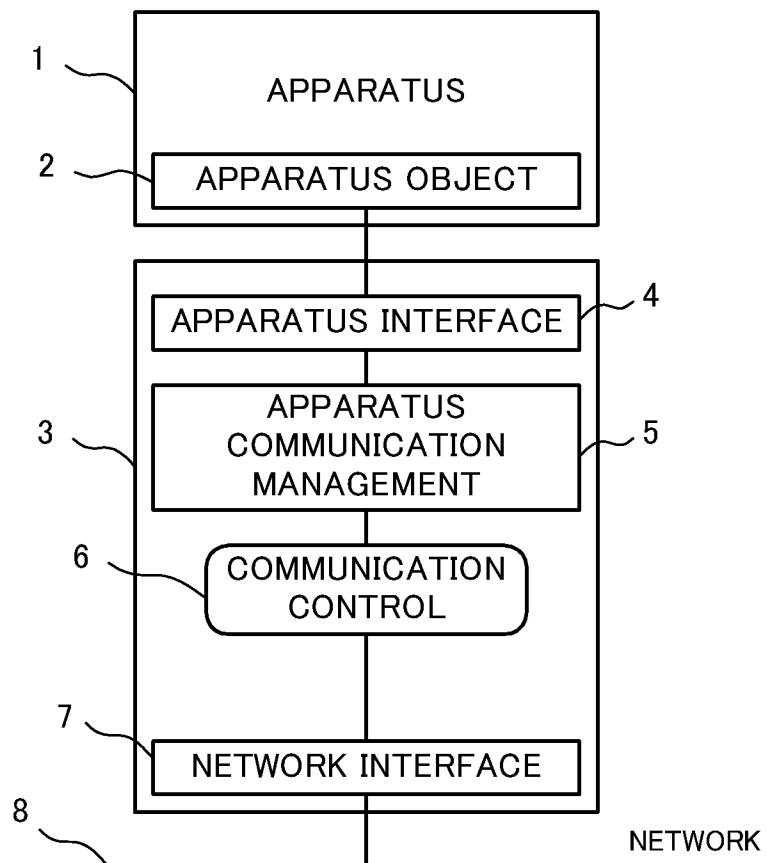
[Object]        To obtain, with respect to a communication adapter apparatus that connects electrical apparatuses, sensors, and other apparatuses to a network, a communication adapter apparatus that allows simplification of setting at the time of execution of works, simplification of execution of works, reduction of power consumption, and simplification of system setting.

[Solution]        The communication adapter that connects one of plural connection object apparatuses having an apparatus object including information, which is based on functions of the apparatuses and operable control items, respectively, and a network to which a controller for remotely controlling the connection object apparatus is connected, is constituted of: communication control means that controls transmission and reception of data to and from the network; apparatus communication managing means that copies and saves the apparatus object, saves a procedure for a communication service of the communication control means, and makes it possible to use the connection object apparatus from the network using these saved data; and apparatus interface means that is defined by standards common to all the apparatuses in order to make all the plural communication object apparatuses connectable.

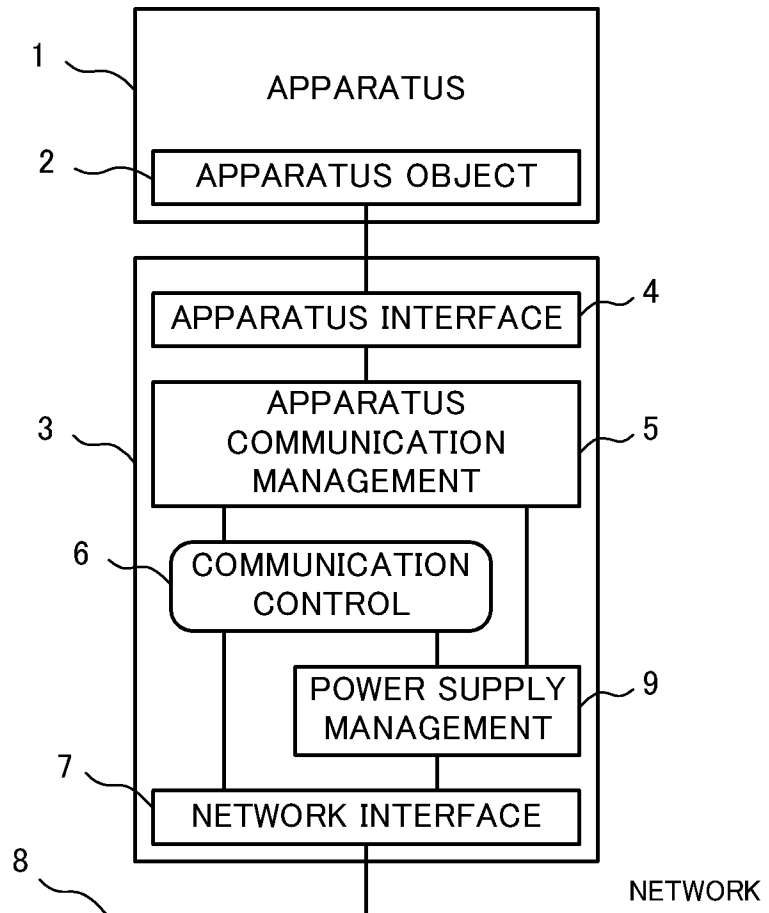
[Selected Drawing]        FIG. 1

# [Name of The Document] DRAWINGS

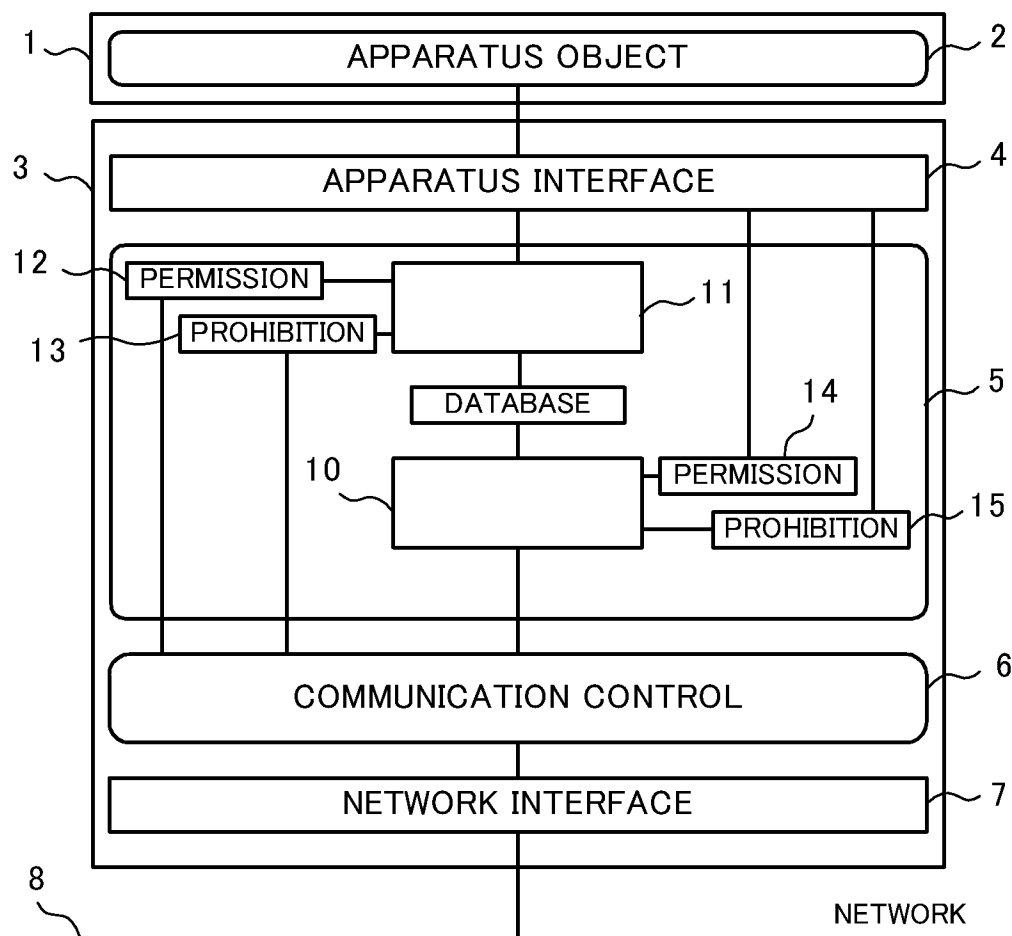
[FIG.1]



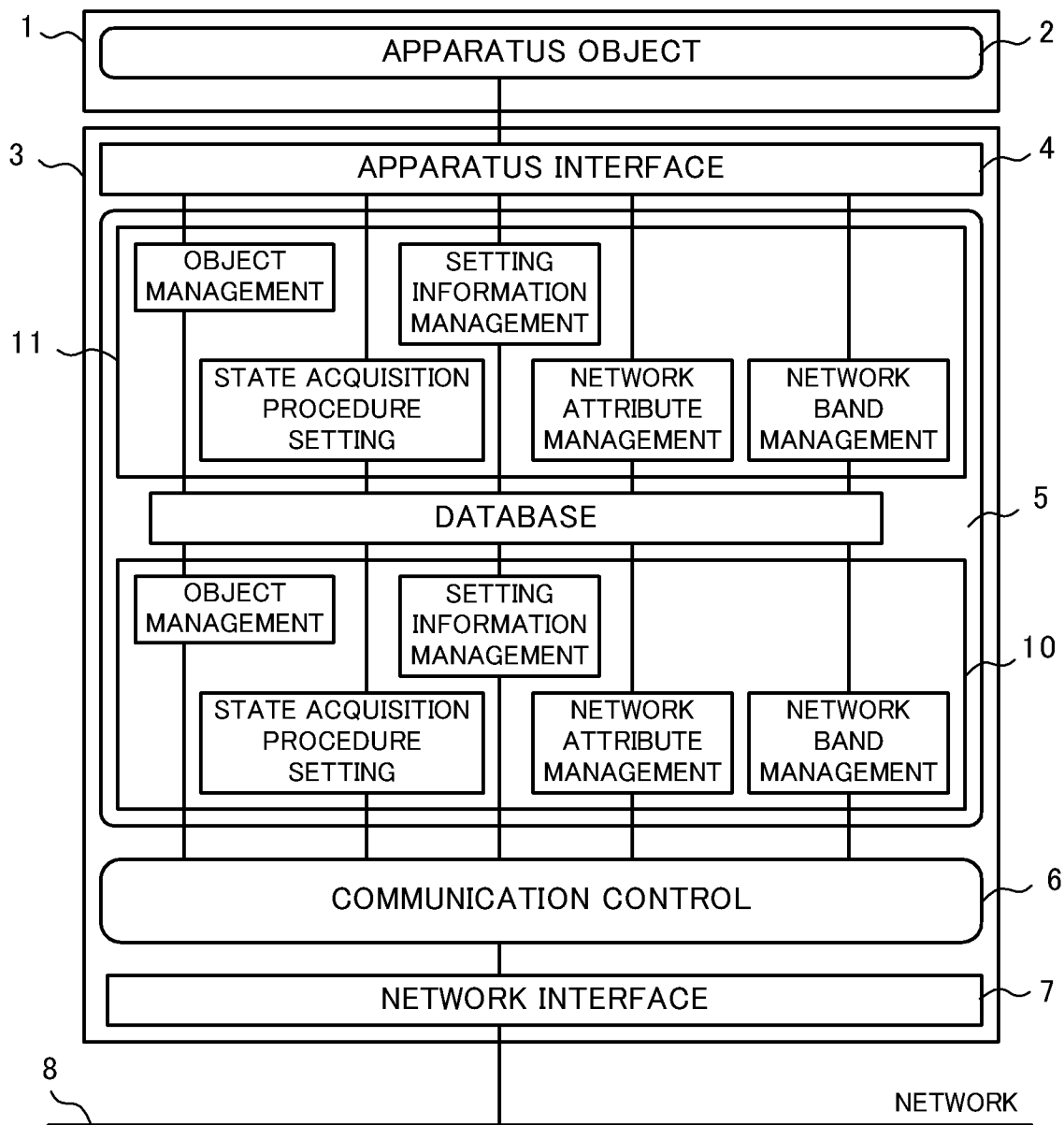
[FIG.2]



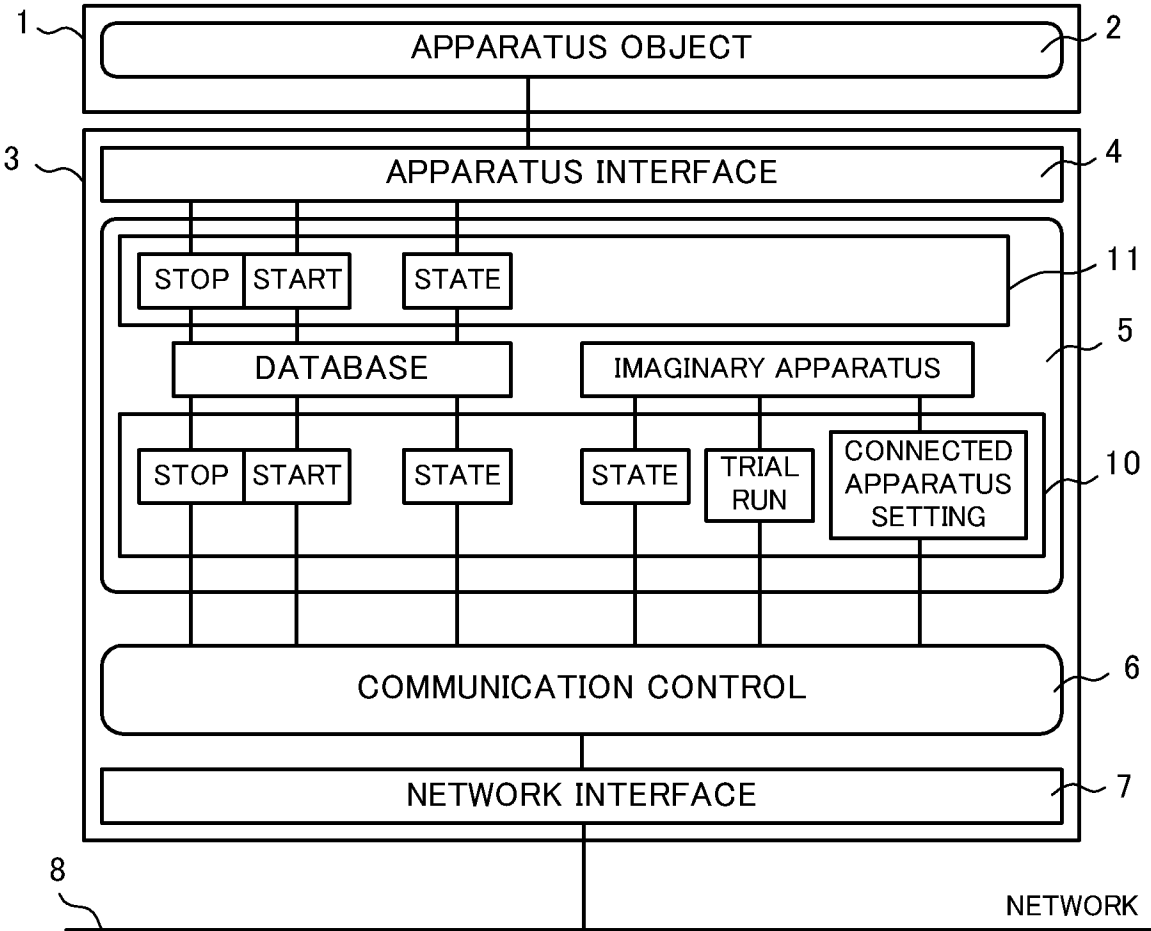
[FIG.3]



[FIG.4]

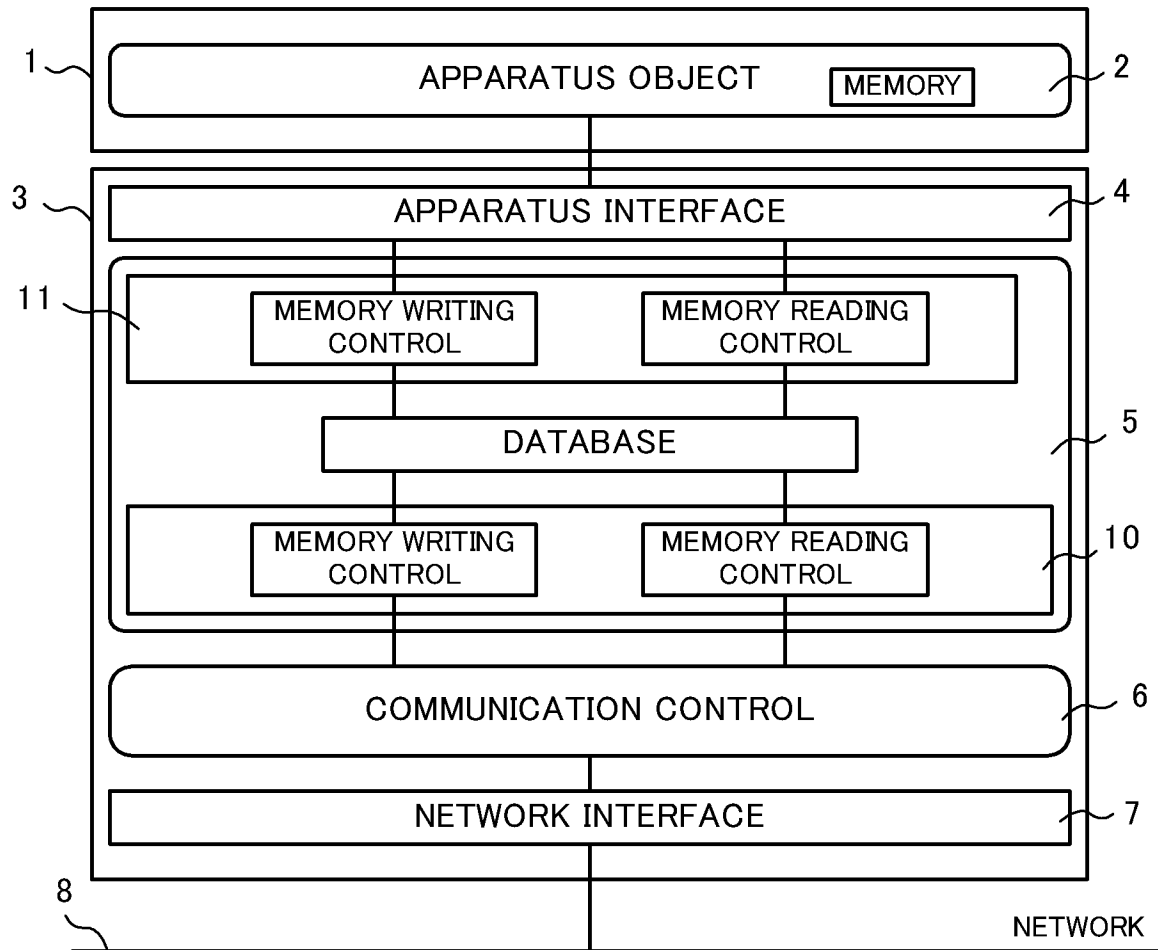


[FIG.5]

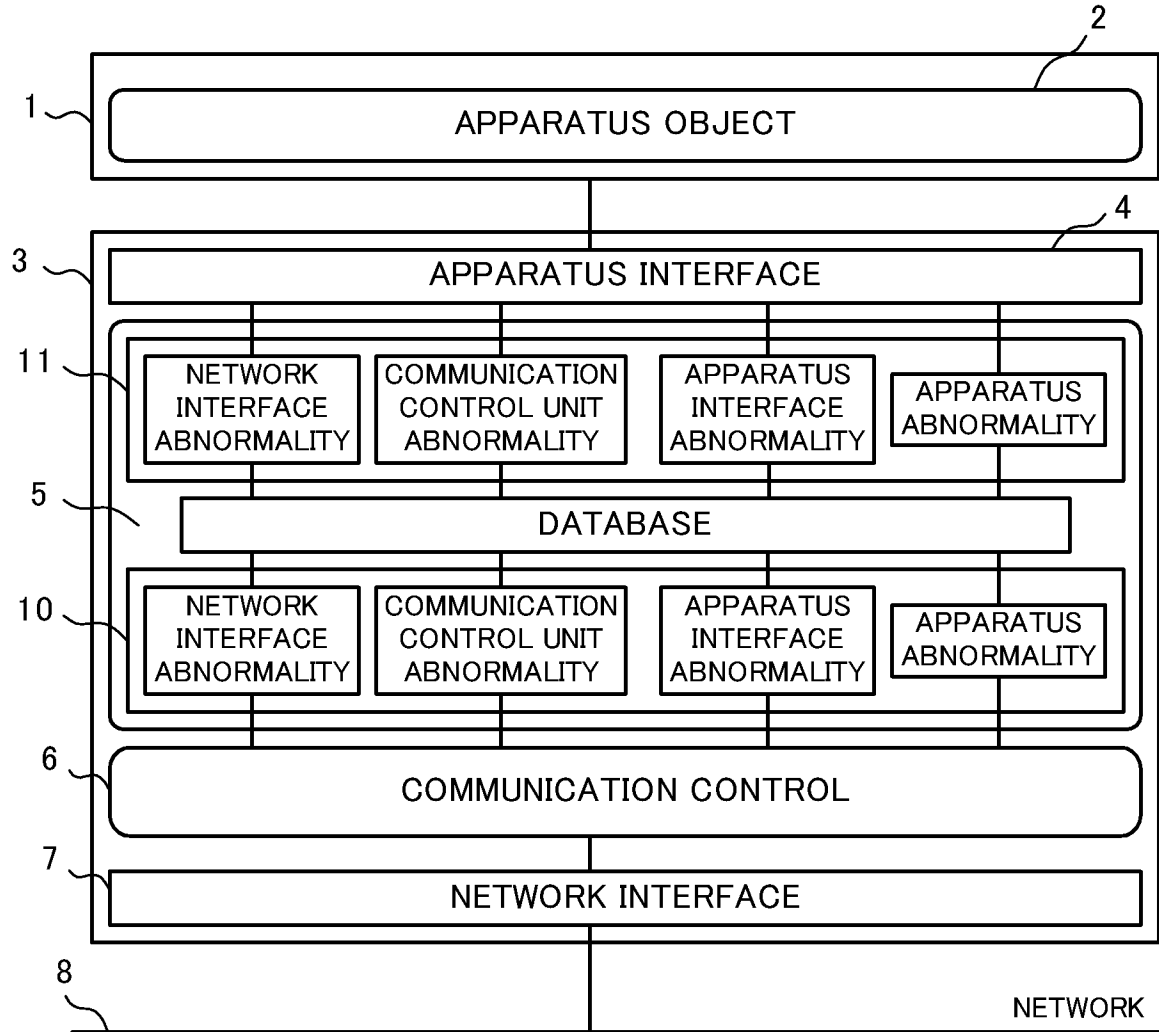




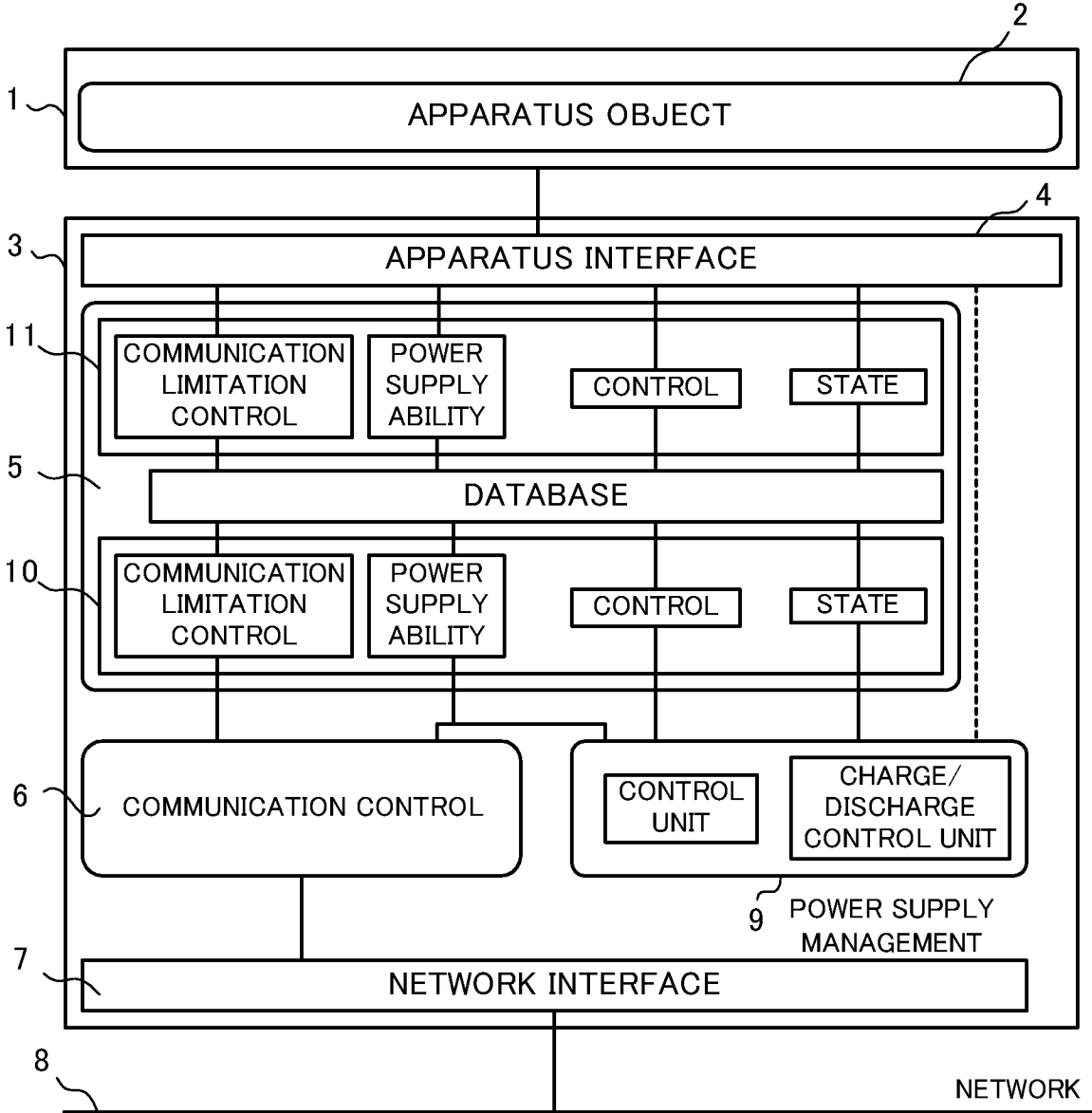
[FIG.6]



[FIG.7]



[FIG.8]



[FIG.9]

